

## SEQUENCE LISTING

<110> Celentis Limited  
AgResearch Limited

<120> Indole-Diterpene Biosynthesis

<130> 42616

<140> NZ 530331

<141> 2003-12-22

<160> 51

<170> PatentIn version 3.3

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<212> DNA

<213> Neotyphodium lolii

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Thr Tyr Leu Glu Glu Lys Val Leu Thr Ala Pro Leu Asp Tyr Leu Arg  
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Glu Phe Leu Arg Val Pro Glu Glu Lys Val Leu Val Ile Lys Arg Ile  
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Ile Asp Leu Leu His Asn Ala Ser Leu Leu Ile Asp Asp Ile Gln Asp  
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Ser Ser Lys Leu Arg Arg Gly Val Pro Val Ala His His Ile Phe Gly  
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Glu Glu Leu Ile Asn Leu His Arg Gly Gln Gly Met Glu Leu His Trp  
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Gly Glu Ser Ala Ser Asp Asp Asp Tyr Val Ser Leu Ile Asp Thr Leu  
 195 200 205

Gly Thr Leu Phe Gln Ile Arg Asp Asp Tyr Gln Asn Leu Gln Ser Asp  
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Ile Tyr Ser Lys Asn Lys Gly Tyr Cys Glu Asp Leu Thr Glu Gly Lys  
 225 230 235 240

Phe Ser Tyr Pro Val Ile His Ser Ile Arg Ser Arg Pro Gly Asp Val  
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Arg Leu Ile Asn Ile Leu Lys Gln Arg Ser Glu Asp Val Met Val Lys  
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Gln Tyr Ala Val Gln His Ile Glu Ser Thr Gly Ser Phe Ala Phe Cys  
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Gln Asn Lys Ile Gln Ser Leu Val Glu Gln Ala Arg Glu Gln Leu Ala  
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 <213> Neotyphodium lolii

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 Ser Phe Gly Tyr Pro Val Ala Phe Leu Glu Arg Gln Arg Phe Leu Gln  
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Ser Asp Gly Ala Lys Tyr Leu Ala Asp Ile Val Ile Gly Ala Asp Gly  
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Val His Ser Ile Val Arg Ser Glu Ile Trp Arg His Leu Lys Glu Asn  
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Ser Gln Ile Ser Val Leu Glu Ala Pro Asn Ala Ser Ile Lys His Asp  
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Tyr Ser Cys Ile Tyr Gly Ile Ser Leu Asn Val Pro Gln Ile Ile Leu  
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Gly Ile Gln Leu Asn Cys Leu Asp Asp Gly Val Ser Ile His Leu Phe  
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Thr Gly Lys Gln Ser Lys Leu Phe Trp Phe Val Ile Ile Lys Thr Pro  
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Gln Ala Ser Phe Ala Lys Val Glu Ile Asp Asn Thr His Thr Ala Arg  
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Cys Ile Cys Glu Gly Leu Arg Thr Lys Lys Val Ser Asp Thr Leu Cys  
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Phe Glu Asp Val Trp Ser Arg Cys Thr Ile Phe Lys Met Thr Pro Leu  
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Glu Glu Gly Val Phe Lys His Trp Asn Tyr Gly Arg Leu Ala Cys Ile  
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Gly Asp Ala Ile Arg Lys Met Ala Pro Asn Asn Gly Gln Gly Ala Asn  
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Ile Ser His Gly Ser Ile Arg Asp Gln Asp Ile Asn Ser Met Phe Gln  
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Ser Trp Glu Phe Ile Leu Gln Ser Leu Val Tyr Leu Arg Pro Lys Phe  
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Ile Val Ala Leu Leu Val Leu Ile Val Cys Ile Phe Leu Tyr Trp Arg  
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Glu Pro Pro Leu Leu Val Gln Met Arg Tyr Val Phe Asn Ala Ala Ser  
 65 70 75 80

Met Ile Arg Glu Gly Tyr Ala Lys Trp Lys Asp Ser Leu Phe Gln Ile

Ser Arg Tyr Asp Gly Asp Ile Leu Ile Val Pro Pro Arg Tyr Leu Asp  
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Asp Leu His Asn Lys Ser Gln Glu Glu Leu Ser Ala Ile Tyr Gly Leu  
 115 120 125

Ile Arg Asn Phe Gly Gly Ser Tyr Ser Gly Ile Thr Leu Leu Gly Glu  
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Asn Asp Val Gly Ile Arg Ala Leu Gln Thr Lys Ile Thr Pro Asn Leu  
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Leu Phe Leu Lys Ala Val Glu Arg Ile Thr His Arg Ile Phe Val Gly  
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Leu Pro Leu Cys Arg Asn Pro Gln Trp Val Gln Ala Thr Ser Lys His  
 210 215 220

Ala His Tyr Ala Thr Met Ile Gln Ile Ala Met Arg Ser Val Pro Lys  
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Phe Ile Gln Pro Leu Leu Asn Phe Cys Leu Pro Trp Pro Trp Lys Asn  
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Ala Ala Cys Val Arg Glu Ala Lys Asn Ala Leu Ile Leu Glu Met Gln  
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Arg Arg Arg Asn Leu Glu Lys Val Asn Ser Phe Asp Tyr Ile Lys Ser  
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Asp Ser Gln Leu Asp Val Val Ala Gln Ile Met Leu Thr Met Asn Thr  
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345

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 385 390 395 400

Ile Thr Leu Gln Asp Gly Thr His Val Pro Tyr Asn Thr Leu Leu Cys  
 405 410 415

Val Ala Pro His Ala Ile Ser Asn Asp Pro Asp Val Ile Glu Asp Pro  
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Thr Ser Phe Asn Gly Leu Arg Tyr Tyr Glu Gln Arg Cys Arg Asp Ala  
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Ser Gln Glu Lys Lys His Gln Tyr Ala Thr Thr Asp Lys Ser His Leu  
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His Phe Gly Tyr Gly Thr Trp Ala Cys Pro Gly Arg Phe Leu Ala Ser  
 465 470 475 480

Asp Met Leu Lys Val Ile Leu Thr Met Leu Leu Leu Gln Tyr Asp Ile  
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Arg Ser Pro Glu Arg Ala Lys Arg Pro Val Ala Gly His Phe His Glu  
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<213> *Neotyphodium lolii*

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Gly Tyr Glu Arg Thr Ser His Glu Gly Ile Gly Gly Ser Asn Gly Lys
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His Phe Ser Pro Leu Val Asp Phe Leu His Pro Thr Leu Lys His Lys
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Lys Asn His Thr Thr Ala His Leu Leu Tyr Gly Ser Cys Glu Thr Ala  
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Leu Glu Gly Gln Asp Met Ser Leu Val Trp Arg Arg Asp Gly Leu Arg  
 180 185 190

Ser Phe Glu Ser Tyr Gly Glu Glu Ser Leu Leu Thr Tyr Lys Asn Met  
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Ala Leu Leu Lys Thr Gly Thr Leu Phe Val Leu Leu Gly Arg Leu Leu  
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Asn Gln Gly Gly His Gln Ser Asp Asp Leu Leu Gly Arg Phe Gly Trp  
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Tyr Ala Gln Leu Gln Asn Asp Cys Lys Asn Ile Tyr Ser Glu Glu Tyr  
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Ala Phe Asn Lys Gly Thr Val Ala Glu Asp Leu Arg Asn Arg Glu Leu  
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Ser Phe Pro Val Val Val Ala Leu Asn Asp Lys His Thr Glu Pro Gln  
 275 280 285

Ile Arg Lys Ala Phe Gln Ser Gln Asn Gln Gly Asp Ile Lys Arg Ala  
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Leu Gln Ala Leu Glu Ser Pro Ser Val Lys Asn Thr Cys Leu Lys Thr  
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 gtagattttc atcttttttt tttccatata aatctccctt caagctcatg tgacgcacat 1620  
 tegaccttct tgactaacc ttgagtttgt gctcatagta tatgattaaa gcaatcatga 1680  
 gtcggattct gctcgagtat gattttaagc tagatagtga gtttccgtcg cggcgccctc 1740

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<210> 10  
<211> 498  
<212> PRT  
<213> Neotyphodium lolii  
<400> 10

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1 5 10 15

Tyr Val Val Tyr Gly Thr Lys Arg Lys Glu Cys Ile Pro Thr Ile Arg  
20 25 30

Arg Trp Pro Arg Leu Leu Pro Gln Phe Leu Asp Arg Leu Ser Tyr Asn  
35 40 45

Asp His Ala Ala Arg Leu Val Lys His Gly Tyr Glu Lys His Lys Asn  
50 55 60

Gln Pro Phe Arg Leu Leu Lys Met Asp Met Asp Leu Ile Val Ile Pro  
65 70 75 80

Leu Gln Tyr Ala Leu Glu Leu Arg Ala Val Thr Ser Asp Lys Leu Asp  
85 90 95

Pro Leu Thr Ala Ser Phe Asp Asp Asn Ala Gly Lys Val Thr Arg Ile  
100 105 110

Leu Leu Gly Ser Glu Leu His Thr Arg Ala Ile Gln Gln Arg Leu Thr  
115 120 125

Pro Lys Leu Pro Gln Thr Leu Pro Val Leu Leu Asp Glu Leu Asn His  
130 135 140

Ala Phe Gly Gln Val Leu Pro Ala Gly Asn Asp Gly Ser Asn Ala Trp  
145 150 155 160

Ile Ser Val Asn Pro Tyr Glu Leu Val Leu Asn Leu Ala Thr Arg Ala  
165 170 175

Thr Ala Arg Leu Phe Val Gly Asp Leu Ile Cys Arg Asn Glu Ile Phe  
180 185 190

Leu Glu Thr Thr Ala Ser Phe Ser Arg Asn Thr Phe Asp Thr Ile Ser  
195 200 205

Thr Ser Arg Ser Phe Gly Asn Leu Phe Thr His Tyr Phe Ala Arg Trp  
 210 215 220

Ile Ser Thr Ala Lys Glu Ala His Gly Gln Leu Gln Tyr Ile Gln Asn  
 225 230 235 240

Leu Leu Gly Ser Glu Val Gln Arg Arg Lys Leu Asn Ser Glu Glu Lys  
 245 250 255

His Asp Asp Phe Leu Gln Trp Cys Thr Glu Leu Ala Val Thr Glu Asp  
 260 265 270

Glu Ala Arg Pro Glu Ala Leu Ala His Arg Thr Leu Gly Ile Leu Ser  
 275 280 285

Met Ala Val Ile His Thr Thr Ala Met Ala Leu Thr His Ile Leu Phe  
 290 295 300

Asp Met Ile Ser Asp Asp Ser Leu Lys Glu Ser Leu Arg Arg Glu Gln  
 305 310 315 320

Gln Asn Val Leu Lys His Gly Trp Thr Glu Ile Thr Gln Gln Thr Met  
 325 330 335

Leu Asp Met Lys Gln Leu Asp Ser Leu Met Arg Glu Ser Gln Arg Ile  
 340 345 350

Asn Pro Val Gly Glu Phe Thr Phe Arg Arg Ile Val Arg Glu Arg Ile  
 355 360 365

Thr Leu Ser Asp Gly Tyr Gln Leu Gln Pro Gly Gln Gln Ile Ala Ile  
 370 375 380

Pro Ala Lys Cys Ile Asn Thr Asp Ser Thr Lys Leu Ser Asp Ala His  
 385 390 395 400

Leu Phe Gln Pro Phe Arg Trp Leu Lys Gln Ser Gly Thr Ala Thr Thr  
 405 410 415

Ser Phe Ser Asn Ser Ser Ala Leu Asn Leu His Phe Gly Phe Gly Arg  
 420 425 430

Tyr Ala Cys Pro Gly Arg Phe Ile Ala Ser Tyr Met Ile Lys Ala Ile  
 435 440 445

Met Ser Arg Ile Leu Leu Glu Tyr Asp Phe Lys Leu Asp Ser Glu Phe  
 450 455 460

Pro Ser Arg Arg Pro Pro Asn Ile Val His Gly Asp Lys Ile Leu Pro  
 465 470 475 480

Asn Arg Asn Ala Val Val Leu Leu Arg Arg Leu Glu Lys Thr Val Thr  
 485 490 495

Val Cys

<210> 11  
 <211> 1945  
 <212> DNA  
 <213> Neotyphodium lolii

<400> 11  
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 cctgggaatg gggaaatgcg cgctccgttt gttggttata gctggccatt cgagcctact 180  
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 tgacagttca aggattccat gttcaagata acgaccaacg atgccgactg gcttgctctc 360  
 tcccaacgct acttggaatga cttgcagtct ctgccagccg agagattgag ccatacagac 420  
 gctctagtga cggtaggggc gcatactagt cgctagtccc tacgacagtg gtgtgctaata 480  
 cgagtttgtt ctcatttaga tgtgggggag cagccacagc ccttttgctc tgctcaacaa 540  
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 ggatctgact tgaaaaggac gtggttgccg cgaattatgc caaggacctt gatagcctcg 660  
 tagacgaact ccgctattcg cttgagcacg atatagacat acaggatggt atgtatgcgc 720  
 ctattttcca actaattttg aggtcgctcat gttggctgac tgggtcgatg cgcttagact 780  
 ggaaaccgat tgatgccctt gaactttctt cgaagtttgt gttgcggata tcgcagcgaa 840  
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 cagacgctgg taagaggacg agctgttacg tatgaccctt ttcttcggtt aaaactaacg 960  
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 gagaaaccaa aggacttgct gcagggcatg gtggacctgg agccgtcccg gcctgttgac 1200  
 aaacttgac atgattttct cgtccaagcc ttgatttcca gaatggctcc agttgttacc 1260  
 atggcccaaa cccttggtga tcttgccctc catcctgagg atatcgagga gctgcgtgat 1320  
 gaggttctgc aagtcataag accagacggg gcgggattag gaaacctacg acaatcattt 1380

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agtgacaatg caccgccggg ttcaggacgc caagggcatc acgctccatg acggtgtgca 1560
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ccaagaaaaac gaagctccca agcatcgatt tgtcaccccc gacagcaact acttgacctt 1740
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gatgaccgcc gtgctcctgc gctacgagtt caagtggcct ccgggagtcc ctgtgcccgga 1860
acaacagtat cggcatgtct ttgcttatcc aagcaaaacc aactgttga ttaaacgacg 1920
caaagatggc gatcagattc tttaa 1945

```

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<210> 12
<211> 525
<212> PRT
<213> Neotyphodium lolii

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<400> 12

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Met Ala Phe Ala Ser Leu Leu His His Ile Trp Asn His Ala Val Asp
1          5          10          15

```

```

Cys Ala Glu Gln Leu Thr Trp Trp Gln Thr Ile Val Ser Phe Ile Ile
      20          25          30

```

```

Phe Cys Ile Met Cys Ser Trp Leu Pro Gly Asn Gly Glu Met Arg Ala
      35          40          45

```

```

Pro Phe Val Gly Tyr Arg Trp Pro Phe Glu Pro Thr Phe Trp Val Arg
50          55          60

```

```

Met Arg Phe Ile Phe Gln Ser Leu Gly Met Met Thr Glu Gly Tyr Ser
65          70          75          80

```

```

Lys Phe Lys Asp Ser Met Phe Lys Ile Thr Thr Asn Asp Ala Asp Trp
      85          90          95

```

```

Leu Val Leu Ser Gln Arg Tyr Leu Asp Asp Leu Gln Ser Leu Pro Ala
100          105          110

```

```

Glu Arg Leu Ser His Thr Asp Ala Leu Val Thr Met Trp Gly Ser Ser
115          120          125

```

```

His Ser Pro Phe Ala Leu Leu Asn Lys Ser Asp Leu Ser Ser Arg Ala
130          135          140

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Leu Arg Asp Val Val Ala Pro Asn Tyr Ala Lys Asp Leu Asp Ser Leu  
 145 150 155 160  
 Val Asp Glu Leu Arg Tyr Ser Leu Glu His Asp Ile Asp Ile Gln Asp  
 165 170 175  
 Asp Trp Lys Pro Ile Asp Ala Leu Glu Leu Ser Ser Lys Leu Val Leu  
 180 185 190  
 Arg Ile Ser Gln Arg Ile Leu Ile Gly Trp Pro Met Ser Arg Asp Gln  
 195 200 205  
 Glu Leu Leu Glu Cys Ala Gln Gly Tyr Ala Asp Ala Ala Thr Val Val  
 210 215 220  
 Gln Phe Ala Leu Lys Leu Leu Pro Arg Gln Ile Arg Pro Leu Val Tyr  
 225 230 235 240  
 Pro Leu Leu Pro Gln Ala Trp Ala Thr Lys Ser Trp Ile Arg Arg Cys  
 245 250 255  
 Asp Lys Ile Leu Ala Lys Glu Met Gln Arg Arg Gln Val Leu Glu Lys  
 260 265 270  
 Ser Asp Pro Val Tyr Glu Lys Pro Lys Asp Leu Leu Gln Gly Met Val  
 275 280 285  
 Asp Leu Glu Pro Ser Arg Pro Val Asp Lys Leu Gly His Asp Phe Leu  
 290 295 300  
 Val Gln Ala Leu Ile Ser Arg Met Ala Pro Val Val Thr Met Ala Gln  
 305 310 315 320  
 Thr Leu Val Asp Leu Ala Leu His Pro Glu Asp Ile Glu Glu Leu Arg  
 325 330 335  
 Asp Glu Val Leu Gln Val Ile Gly Pro Asp Gly Ala Gly Leu Gly Asn  
 340 345 350  
 Leu Arg Gln Ser Phe Thr Lys Leu Asp Lys Met Asp Ser Val Leu Arg  
 355 360 365  
 Glu Ser Ala Arg Phe Thr Pro Leu Ser Met Met Thr Met His Arg Arg  
 370 375 380  
 Val Gln Asp Ala Lys Gly Ile Thr Leu His Asp Gly Val His Leu Pro  
 385 390 395 400

Arg Gly Thr His Val Ala Phe Pro Ala Tyr His Ile Gly Arg Asp Pro  
 405 410 415

Lys Leu Val Ser Gly Ala Asp Ile Tyr Asp Gly Leu Arg Trp Tyr Arg  
 420 425 430

Lys Asp Leu Gly Glu Ala Gln Glu Asn Glu Ala Pro Lys His Arg Phe  
 435 440 445

Val Thr Pro Asp Ser Asn Tyr Leu Thr Phe Gly Ser Gly Lys Tyr Val  
 450 455 460

Cys Pro Gly Arg Phe Ile Ala Glu His Met Leu Lys Leu Met Met Thr  
 465 470 475 480

Ala Val Leu Leu Arg Tyr Glu Phe Lys Trp Pro Pro Gly Val Pro Val  
 485 490 495

Pro Glu Gln Gln Tyr Arg His Val Phe Ala Tyr Pro Ser Lys Thr Thr  
 500 505 510

Leu Leu Ile Lys Arg Arg Lys Asp Gly Asp Gln Ile Leu  
 515 520 525

<210> 13  
 <211> 2014  
 <212> DNA  
 <213> Neotyphodium lolii

<400> 13  
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 tgaatctggt tcccttgcta tgcacttttc ttggatgctc accaaaattt ttcaagggtga 180  
 atgtacctgt tggtggcatt ggagttcgat atacaaaatg gctagcggct attataaacg 240  
 tgcgtcatgc tcgacaatct atccgcgagg gctatgcaaa ggtttgtggt aaaaacgaat 300  
 aaaagcgctt cgtaaacaaa gagaactaat actagtttct agtatggcga tttcgcgttt 360  
 cagataccta ctatgactcg aatggaggta ttcatttgtg atagacagat gacaaggagg 420  
 tatcagaatg ttgacgacta tcatttgtcg ttccgagctg tcatgaccga ggtaagtaac 480  
 tagaccatgt taactgtagg aaaagaagaa aaagctaaac cgccgtacag gagtttcaat 540  
 tcaaatggct acttccagga caggcacacg aagcccggat tatccctaac tcagtgtattg 600  
 ctaaggcctt gagctggcag agaacaaggg cgaataaacc cagcgatcca ttcttcgaat 660  
 ctttctccgc cgaattcatg caggggtttc aggaagagat gcgacgacta atccaatatc 720

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aaaattcgtc agttatgtca aacogctccg gtgctgtcct ggatccagcg catggttggc 780
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cacgtcctga atatagcgat gcgcttctgg aagagataga tgcattgctt gaaaagcatg 1440
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gcattttggg actggacgtc acgcctgtcc tggtagattt atggtttctg atgaggtcaa 1860
gttagctgtg attcatatct taagtaattt cgatttttgt attgagaatt ttggaccacg 1920
gccagcaaat cagccatttg gtaaatttct tctacctgat atgagtgcaa aaatctggct 1980
aaggagagaaa agagctaggg agaagaatct gtga 2014

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&lt;210&gt; 14

&lt;211&gt; 537

&lt;212&gt; PRT

&lt;213&gt; Neotyphodium lolii

&lt;400&gt; 14

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Met Lys Met Leu Thr Glu His Phe Asp Phe Pro Lys Leu Asn Phe Ala
1             5             10            15

```

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Thr Ile Val Ile Ser Gly Ala Thr Ile Ile Gly Ile Ile Phe Leu Arg
20             25            30

```

```

Tyr Leu Asn Tyr Pro Thr Lys Val Asn Val Pro Val Val Gly Ile Gly
35             40            45

```

Val	Arg	Tyr	Thr	Lys	Trp	Leu	Ala	Ala	Ile	Ile	Asn	Val	Arg	His	Ala	
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Arg	Gln	Ser	Ile	Arg	Glu	Gly	Tyr	Ala	Lys	Tyr	Gly	Asp	Phe	Ala	Phe	
65					70					75					80	
Gln	Ile	Pro	Thr	Met	Thr	Arg	Met	Glu	Val	Phe	Ile	Cys	Asp	Arg	Gln	
				85					90					95		
Met	Thr	Arg	Glu	Tyr	Gln	Asn	Val	Asp	Asp	Tyr	His	Leu	Ser	Phe	Arg	
			100					105						110		
Ala	Val	Met	Thr	Glu	Glu	Phe	Gln	Phe	Lys	Trp	Leu	Leu	Pro	Gly	Gln	
		115					120					125				
Ala	His	Glu	Ala	Arg	Ile	Ile	Pro	Asn	Ser	Val	Ile	Ala	Lys	Ala	Leu	
	130					135					140					
Ser	Trp	Gln	Arg	Thr	Arg	Ala	Asn	Lys	Pro	Ser	Asp	Pro	Phe	Phe	Glu	
145					150					155					160	
Ser	Phe	Ser	Ala	Glu	Phe	Met	Gln	Gly	Phe	Gln	Glu	Glu	Met	Arg	Arg	
				165					170					175		
Leu	Ile	Gln	Tyr	Gln	Asn	Ser	Ser	Val	Met	Ser	Asn	Arg	Ser	Gly	Ala	
			180					185					190			
Val	Leu	Asp	Pro	Ala	His	Gly	Trp	His	Ala	Val	Pro	Cys	Phe	Pro	Leu	
		195					200					205				
Ala	Leu	Lys	Val	Ile	Gly	Arg	Leu	Thr	Thr	Tyr	Val	Leu	Phe	Gly	Lys	
		210				215					220					
Pro	Leu	Cys	Gln	Asp	Ala	Thr	Phe	Leu	Asn	Met	Cys	Cys	Gln	Phe	Gly	
225					230					235					240	
Asp	Val	Ile	Pro	Arg	Asp	Ala	Ile	Ile	Leu	Arg	Ser	Trp	Pro	Ala	Leu	
				245					250					255		
Ala	Arg	Pro	Leu	Ile	Val	Lys	Ile	Leu	Ser	Ala	Pro	Arg	Val	Met	Gly	
			260					265					270			
Lys	Leu	Arg	Asn	Ile	Leu	Ile	Val	Glu	Ile	Lys	Ser	Arg	Arg	Glu	Ser	
		275					280					285				
His	Glu	Thr	Asn	Pro	Met	Ser	Asp	Ile	Leu	Asp	Phe	Thr	Met	Ala	Trp	
	290					295					300					

Val Asp Arg His Pro Asn Ala Ser Phe Asp Asp Gln His Ile Ala Glu  
 305 310 315 320

Met Met Ile Asn Thr Ile Phe Ala Ala Leu His Thr Ser Ser Gln Leu  
 325 330 335

Val Val His Thr Ile Phe Glu Leu Ala Ser Arg Pro Glu Tyr Ser Asp  
 340 345 350

Ala Leu Leu Glu Glu Ile Asp Ala Cys Phe Glu Lys His Gly Lys Gly  
 355 360 365

Thr Lys Ala Ala Leu Asp Ser Met Phe Lys Val Asp Ser Phe Ile Lys  
 370 375 380

Glu Thr Gln Arg Phe Asn Pro Leu Asp Ala Ser Ala Leu Ala Arg Leu  
 385 390 395 400

Ala Leu Lys Asp Phe Thr Phe Ser Asn Gly Leu Asn Ile Pro Lys Gly  
 405 410 415

Ser Val Ile Phe Thr Pro Asn Ser Pro Ile Phe Glu Asp Glu Arg Tyr  
 420 425 430

Tyr Lys Asp Pro Lys Val Phe Asp Gly Phe Arg Phe Ala Arg Met Arg  
 435 440 445

Asn Asp Pro Lys Leu Gly Leu Phe Cys Asp Leu Thr Ala Thr Asn Glu  
 450 455 460

Gln Ser Met His Phe Gly Thr Gly Arg His Ala Cys Pro Gly Arg Phe  
 465 470 475 480

Met Val Ser Asp Glu Val Lys Leu Ala Val Ile His Ile Leu Ser Asn  
 485 490 495

Phe Asp Phe Cys Ile Glu Asn Phe Gly Pro Arg Pro Ala Asn Gln Pro  
 500 505 510

Phe Gly Lys Phe Leu Leu Pro Asp Met Ser Ala Lys Ile Trp Leu Arg  
 515 520 525

Glu Lys Arg Ala Arg Glu Lys Asn Leu  
 530 535

<210> 15

<211> 1496

<212> DNA

<213> Neotyphodium lolii

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<400> 15
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tactgcactg cagacaaggc cgctcaacta cgcattttgt cagagttggt gctccccaat      180
cttggccctc ggccgtccaa tgccactggg ccatcctatc ttacacgaag tggttcccca      240
ataatgttaa gtctaaatac aacatcatca aaaaactgcg tcagatattg ctgggagatt      300
ctagggggcga ctggcgcaag taatgatgat cttttggcag tccaagttgc taaggatgta      360
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caaggcttcg tacctgaggg aatggagtgc gatcttccaa agagaatccc gttcgccatg      540
acatcattcg acctaaatgg ctccaatgta gctatgaagc tctacgttaa tccaagggta      600
aaggagattt taactgggtac tccctcatca gacttgggtct gggagttcct ccgaaattta      660
acaccagaaa tgaaaccacg agcggtcgac ttgcttgaga ggtaagaatg gctttgaact      720
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ttaccgataa ttcaggcccg tctgctattg agcttgtagg tattgactgc gttgacgacg      840
ctcacctatc aaatgcaagg gtcaagcttt acgttcatac catgagcagc tcatTTaaca      900
ccgtaaagaa ttatgttact cttgggggtg caatctggga tgaacaaacc caaaagggct      960
taggaatact acaaagtatt tggcacctat tgcttcagga gccagagggg atttctgaca     1020
atggattcga caagcctgtg aacgactctt ccatgttatg ccaaaagcta tattttagtt     1080
tcgagctacg cccaggtaaa gacttccctc aggtgaagac ctatgtgcca acttggaact     1140
atcttcgaac cgacggggaa actatccaga actatgaggc gatcttccga gcttgtgacc     1200
atccttgggg tgaagatagg acgtacggca aaatttttca agatgcattg taagttatcc     1260
cttcagatta gcgctaaaag gagtttgaga tactcctcaa tgcaagctat taggttgtga     1320
aattgccact actaattgga gctttttata gcggacctgc aaccgagagt cggaaaaaac     1380
ccattcactg cgacgcctct tttctgttta ccgaagaaac tgggtgtctac cagacgctgt     1440
atttcagtcc tccgattgag ggggaaacag aagtccagtc aaatctcgtt gcttga         1496

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<210> 16

<211> 439

<212> PRT

<213> *Neotyphodium lolii*

<400> 16

Met	Ile	Ala	Lys	Asn	Ile	Glu	Leu	Asn	Gly	Leu	Asp	Pro	Ala	Thr	Arg
1			5					10						15	

Ala Leu Asp Ile Leu Tyr Trp Lys Asn His Cys Ile Lys Gln Leu Glu  
 20 25 30

Ser Leu Leu Cys Ala Thr Asp Ser Tyr Cys Thr Ala Asp Lys Ala Ala  
 35 40 45

Gln Leu Arg Ile Leu Ser Glu Leu Val Leu Pro Asn Leu Gly Pro Arg  
 50 55 60

Pro Ser Asn Ala Thr Gly Pro Ser Tyr Leu Thr Arg Ser Gly Ser Pro  
 65 70 75 80

Ile Met Leu Ser Leu Asn Thr Thr Ser Ser Lys Asn Cys Val Arg Tyr  
 85 90 95

Cys Trp Glu Ile Leu Gly Ala Thr Gly Ala Ser Asn Asp Asp Pro Leu  
 100 105 110

Ala Val Gln Val Ala Lys Asp Val Val Ala Ser Leu Ser Ala Thr Phe  
 115 120 125

Arg Leu Ser Thr Lys Trp Ser Glu Thr Leu Leu Ser Asn Phe Ala Val  
 130 135 140

Thr Pro Asp Gln Ala Arg Gln Val Ile Asn Met Leu Pro Glu Trp Ile  
 145 150 155 160

Gln Gly Phe Val Pro Glu Gly Met Glu Cys Asp Phe Pro Lys Arg Ile  
 165 170 175

Pro Phe Ala Met Thr Ser Phe Asp Leu Asn Gly Ser Asn Val Ala Met  
 180 185 190

Lys Leu Tyr Val Asn Pro Arg Val Lys Glu Ile Leu Thr Gly Thr Pro  
 195 200 205

Ser Ser Asp Leu Val Trp Glu Phe Leu Arg Asn Leu Thr Pro Glu Met  
 210 215 220

Lys Pro Arg Ala Val Asp Leu Leu Glu Arg Phe Ile Thr Asp Asn Ser  
 225 230 235 240

Gly Pro Ser Ala Ile Glu Leu Val Gly Ile Asp Cys Val Asp Asp Ala  
 245 250 255

His Leu Ser Asn Ala Arg Val Lys Leu Tyr Val His Thr Met Ser Ser  
 260 265 270

Ser Phe Asn Thr Val Lys Asn Tyr Val Thr Leu Gly Gly Ala Ile Trp  
 275 280 285

Asp Glu Gln Thr Gln Lys Gly Leu Gly Ile Leu Gln Ser Ile Trp His  
 290 295 300

Leu Leu Leu Gln Glu Pro Glu Gly Ile Ser Asp Asn Gly Phe Asp Lys  
 305 310 315 320

Pro Val Asn Asp Ser Ser Met Leu Cys Gln Lys Leu Tyr Phe Ser Phe  
 325 330 335

Glu Leu Arg Pro Gly Thr Asp Phe Pro Gln Val Lys Thr Tyr Val Pro  
 340 345 350

Thr Trp Asn Tyr Leu Arg Thr Asp Gly Glu Thr Ile Gln Asn Tyr Glu  
 355 360 365

Ala Ile Phe Arg Ala Cys Asp His Pro Trp Gly Glu Asp Arg Thr Tyr  
 370 375 380

Gly Lys Ile Phe Gln Asp Ala Phe Gly Pro Ala Thr Glu Ser Arg Lys  
 385 390 395 400

Lys Pro Ile His Cys Asp Ala Ser Phe Leu Phe Thr Glu Glu Thr Gly  
 405 410 415

Val Tyr Gln Thr Leu Tyr Phe Ser Pro Pro Ile Glu Gly Glu Thr Glu  
 420 425 430

Val Gln Ser Asn Leu Val Ala  
 435

<210> 17  
 <211> 1110  
 <212> DNA  
 <213> *Epichloe festucae*

<400> 17  
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 atactgctcc ttataatct cgaatgccac ttaaaattta gacaggthtt gacagcgccg 180  
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<211> 334
<212> PRT
<213> Epichloe festucae

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Thr Tyr Leu Glu Glu Lys Val Leu Thr Ala Pro Leu Asp Tyr Leu Arg
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Ala Leu Pro Ser Lys Asp Ile Arg Ser Gly Leu Thr Asp Ala Ile Asn
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Glu Phe Leu Arg Val Pro Glu Glu Lys Val Leu Val Ile Lys Arg Ile
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Ile Asp Leu Leu His Asn Ala Ser Leu Leu Ile Asp Asp Ile Gln Asp
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Ser Ser Lys Leu Arg Arg Gly Val Pro Val Ala His His Ile Phe Gly
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Arg Glu Ser Leu His Cys Pro Thr Glu Asp Glu Tyr Leu Arg Met Ile  
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Gln Lys Lys Thr Gly Gly Leu Phe Arg Leu Ala Ile Arg Leu Leu Gln  
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Gly Glu Ser Ala Ser Asp Asp Asp Tyr Val Ser Leu Ile Asp Thr Leu  
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Gly Thr Leu Phe Gln Ile Arg Asp Asp Tyr Gln Asn Leu Gln Ser Asp  
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Ile Tyr Ser Lys Asn Lys Gly Tyr Cys Glu Asp Leu Thr Glu Gly Lys  
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Phe Ser Tyr Pro Val Ile His Ser Ile Arg Ser Arg Pro Gly Asp Val  
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Arg Leu Ile Asn Ile Leu Lys Gln Arg Ser Glu Asp Val Met Val Lys  
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Gln Tyr Ala Val Gln His Ile Glu Ser Thr Gly Ser Phe Ala Phe Cys  
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Gln Asn Lys Ile, Gln Ser Leu Val Glu Gln Ala Arg Glu Gln Leu Ala  
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 <213> *Epichloe festucae*

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 <213> *Epichloe festucae*

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Gly Asp Ala Ile Arg Lys Met Ala Pro Asn Asn Gly Gln Gly Ala Asn  
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Met Ala Ile Glu Asp Ala Cys Ser Leu Ala Asn Ile Leu Gln Lys Lys  
 325 330 335

Ile Ser His Gly Ser Ile Arg Asp Gln Asp Ile Asn Ser Met Phe Gln  
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Glu Phe Ser Met Ala Gln Arg Ala Arg Thr Glu Ser Val Cys Ala Gln  
 355 360 365

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Leu Leu Gly Arg Tyr Leu Ile Pro Phe Leu Tyr Asp Ala Pro Ala Gly  
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Leu Ser Gly Phe Ser Ile Ser Gly Ala Thr Arg Ile Glu Phe Ile Asp  
 405 410 415

Leu Pro Thr Arg Ser Leu Arg Gly Ala Trp Gly Lys Ser Trp Arg Gly  
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Ser Trp Glu Phe Ile Leu Gln Ser Leu Val Tyr Leu Arg Pro Lys Phe  
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 <212> DNA  
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 <213> *Epichloe festucae*

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Gln	Val	Phe	Arg	His	Val	Glu	Leu	Arg	Val	Thr	Lys	Gln	Ala	Leu	Gly
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Val	Ala	Pro	His	Ala	Ile	Ser	Asn	Asp	Pro	Asp	Val	Ile	Glu	Asp	Pro
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485

490

495

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